



**ORIGINAL RESEARCH PAPER**

**Medicine**

**A STUDY OF INFECTION PROFILE IN CANCER PATIENTS**

**KEY WORDS:** Infection profile, Cancer chemotherapy, cancer

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**ABSTRACT**  
 Infections are a major cause of morbidity and mortality in cancer patients. The risk of infections is principally related to the intensity and duration of the immunosuppressive chemotherapy. The study was conducted on 50 patients documented as having cancer and who were admitted in J.K Hospital and Research Center, Bhopal from the period 1st March 2016 to 1st March 2018. Incidence of infections was found to be 26% (13 out of 50 patients) in our study. A large proportion of patients included in this study belonged to age group of 45- 54 years (12 = 24%) and males were 21 (42%) and females were 29 (58%). Hematological malignancies were most common malignancies, present in 26(52%) patients, and solid tumors in 24 (48%) patients. Chemotherapy plus radiotherapy were the commonest mode of anticancer therapy (72%). All the patients (n=50) had decreased neutrophil counts of varying severity. Respiratory system as most frequently involved (54%), followed by gastrointestinal (22%), genitourinary (14%), and others (12%). Gram negative organisms were most frequently isolated (8=61.53%), followed by gram positive organisms (4 = 30.76%) in which Staphylococcus aureus was the only organism isolated. Acid fast bacilli i.e. Mycobacterium tuberculosis was isolated in one case (7.69%). Mortality rate was 4% as out of 50 patients, 2 died.

**INTRODUCTION**

Infections are a major cause of morbidity and mortality in cancer patients. The risk of infections is principally related to the intensity and duration of the immunosuppressive chemotherapy. In the 1980's there was a shift in the relative prevalence of specific pathogens afflicting patients with cancer. Whereas in the 1960's and 1970's Gram Negative bacterial pathogens (Enterobacteriaceae & Pseudomonas aeruginosa ) were the principal cause of bacteremia, in 1980's and 1990's Gram Positive bacterial pathogens became predominant.<sup>1</sup> The spectrum of invasive fungal infections have dramatically increased in patients with prolonged neutropenia. Examples of such emerging pathogens include.<sup>2</sup> Most infections occur about 12-14 days after the first day of chemotherapy.<sup>3</sup>

Although the precise reasons for the changing patterns of bacterial pathogens are unknown, the use of intensive chemotherapeutic regimens (with associated immune suppression and mucositis)<sup>4</sup>, antimicrobial prophylaxis targeted against gram negative bacilli, selective gut decontamination, invasive procedures/ catheters have all been cited as possible contributing factors.

Antibiotic resistant bacteria tend to be more prevalent in neutropenic patients because they are exposed to prolonged courses of broad spectrum anti microbials. Eg : Enterobacteriaceae expressing extended spectrum -Lactemases (ESBLs), fluoroquinolone resistant E.Coli, Mithicillin resistant staphylococci and vancomycin resistant enterococci. The early increase in infections attributable to viridans streptococci is also a common, these infections can result in severe complications (ARDS. Shock) in neutropenic patients.<sup>4,5</sup>

In neutropenic patients, who are undergoing anticancer treatment it is a wise decision to start the treatment with appropriate antibiotics to reduce morbidity and mortality.

Infections are one of the major cause of mortality in patients with cancer. Thus this study was conducted to analyze the infections and their outcome in patients with cancer and to study their impact on morbidity and mortality of patients.

**MATERIAL AND METHODS**

The study was conducted on 50 patients documented as having cancer and who were admitted in J.K Hospital and Research Center, Bhopal from the period 1st March 2016 to 1st March

2018, due to various other reasons e.g. Septicemia, ARDS etc. Patients satisfying inclusion criteria of recorded single oral temperature of >38.3° C (101° F) or greater than or equal to 38° C (100° F) over at least 1 hour or with clinically evident focus of infection (in case of absence of fever) were included. Those with pre-existing infections.(Before diagnosis of cancer) or patients with HIV infection . An informed consent was obtained from all the patients included in study. All patients were investigated for CBC with ESR, Blood Culture, Urine Culture, Sputum for Culture, Stool for ova/cyst & Culture, Chest X-ray, HIV, HbsAg, Renal Function Test and Liver Function Test.

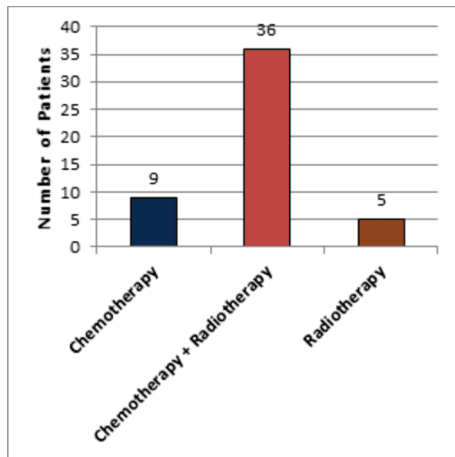
**RESULTS**

Incidence of infections was found to be 26% (13 out of 50 patients) in our study. A large proportion of patients included in this study belonged to age group of 45- 54 years (12 = 24%), followed by patients falling in age group of 15- 24 (6 = 12%) and group of more than 75 years (7 = 14%) also made up large number of study group population. As far as sex ratio is concern, there was not much difference between the sex distribution in study group, where males were 21 (42%) and females were 29 (58%).

Housewife emerged as the major occupational cohort in the study group (22 = 44%) followed by persons who were retired from the service (18 = 36%), followed by agriculture workers (4 = 8%), and others i.e. *Business, Engineers etc.* (6 = 12%). A major proportion of patients were from high socio economic status (33=66%) and 17 (34%) were from low socio economic status.

**TABLE 1: CANCER PROFILE OF PATIENTS**

Type of Malignancy	Number	Percentage
<b>Haematological</b> (Leukemia, Lymphoma, Myeloma)	26	52
<b>Solid Tumours</b> (Carcinoma lung, Breast, Oesophagus)	24	48



**GRAPH 1: DISTRIBUTION ACCORDING TO CANCER THERAPY**

Hematological malignancies were most common malignancies in our study group (leukemia, lymphoma, myeloma), present in 26(52%) patients, followed by solid tumors (Carcinoma of lung, breast, oesophagus, ovary and Ewing’s sarcoma) in 24 (48%) patients.

Chemotherapy plus radiotherapy were the commonest mode of anticancer therapy received by 36 (72%) patients in study group. All the patients (n=50) had decreased neutrophil counts of varying severity. Out of which 21(42%) patients had Absolute Neutrophil Count (ANC) between 1500-1900/mm<sup>3</sup> (Grade 1), 10(20%) patients had counts between 1000-1499/mm<sup>3</sup> (Grade 2), 8(16%) had Grade-3 counts between 500-999/mm<sup>3</sup> while ANC <500/mm<sup>3</sup> ANC was found in 11(22%) patients.

**TABLE 2: INFECTION PROFILE OF CANCER PATIENTS.**

Type of Organisms	Number	Percentage
Gram Positive	4	30.76
Gram Negative	8	61.53
Acid Fast	1	7.69

Clinical signs and symptoms for infective involvement at time of presentation showed, respiratory system as most frequently involved (54%), followed by gastrointestinal (22%), genitourinary (14%), and others i.e. long term IV line, urinary catheters, central venous lines etc. (12%). Gram negative organisms were most frequently isolated (8=61.53%) which included E.coli, Klebsiella, Providentia etc, followed by gram positive organisms (4 = 30.76%) in which Staphylococcus aureus was the only organism isolated. Acid fast bacilli i.e. Mycobacterium tuberculosis was isolated in one case (7.69%).

Antimicrobial therapy received by the all patients in study group. A sub group of patients received duo therapy with Cephalosporins and Aminoglycoside in 28(56%) patients followed by monotherapy in 21(42%) patients. Antifungal therapy started in 8(16%) patients along with duo therapy who took more than 2 weeks for recovery.

Mortality rate was 4% as out of 50 patients, 2 died. Time taken for the full clinical recovery of the patients after the initiation of treatment was 0- 1 week in 25 patients = 50%, 1- 2 weeks in 15 patients = 30%, 2- 3 weeks in 4 patients = 08%, > 3 weeks in 4 patients = 08% out of which 2 patients.

**DISCUSSION**

In a study done by Hann and Viscoli et al<sup>2</sup> there was no significant difference in overall rate of bacteriemia in children less than 18 years and adults. While the present study shows largest number of infections was seen middle and elderly age groups. Children under 18 years of age developed more streptococcal infections where as adults developed more staphylococcal infections, in a study done by Hann and Viscoli et al<sup>2</sup>. In this study no streptococcal infection was detected in any of the age groups, while in all cases of gram

positive bacteriemia, staphylococcus was the only organism isolated. In study by Hann and Viscoli et al<sup>2</sup>, overall mortality was higher in adults compared to children less than 18 years, in this study mortality rates were same in children and adults.

Shift in bacteriological spectrum was shown in a study by Zinner<sup>1</sup> in which it was shown that there has been a clear shift in infecting organisms, so that 60 -70% of bacteriemia with single organisms, are due to gram positive organisms compared to Spectrum two decades earlier, when 60- 70% of infections were caused by gram positive bacteria out of ~ 20% of febrile patients with neutropenia. In our study gram negative was still most common infectious organisms making 61.53% of total cases were causative organism was isolated. In a study by Zinner<sup>1</sup> some of the causes of shift towards gram positive infections include oral mucositis as a result of increase in use of potent chemotherapeutic regimens, profound and prolonged neutropenia, increasing use of long dwelling intravascular catheters, use of antacids and H<sub>2</sub> blockers. In this study the use of chemotherapeutic agents and profound neutropenia were shown to be associated with increased frequency of infections, long dwelling intravascular and urinary catheters were found to be associated with gram negative infections.

In a study done by Morrison<sup>9</sup> in patients treated with conventional alkylating agents, infections commonly occur at mucosal sites, especially respiratory tract. In this study also most of the patients presented with signs and symptoms suggestive of respiratory tract involvement and almost all of them were on anticancer chemotherapy, 72% patients were on chemotherapy combined with radiotherapy and 18% were on chemotherapy alone.

In the study by Morrison<sup>9</sup> both gram positive and gram negative organisms were isolated from respiratory tract in which staphylococcus aureus, and pseudomonas were predominant. In this study gram positive organism, staphylococcus aureus was the most prominent organism isolated from respiratory tract.

In a study done by Pizzo<sup>8</sup> neutropenia itself (less than 500 polymorphs /mm<sup>3</sup>) is a single most important risk factor for the infections, other factors which can alter the risk of infection are, degree of neutropenia (Patient with less than 100 neutrophils / cubic mm. are at highest risk of infections), alterations in physical defence barriers (eg : due to mucositis, presence of indwelling catheters). In this study patient who had ANC less than 1000 cubic mm were also at risk of getting infections although patient having ANC less than 500 cubic mm were at greater risk. Other factors such as mucositis associated with ongoing chemotherapy and presence of indwelling catheters also appeared to play a role.

In a study, Pizzo<sup>8</sup> used some 3rd generation cephalosporins which have bactericidal activity against enterobacteriaceae, P.aeruginosa and many gram positive organisms, monotherapy can be safe and cost effective alternative to combination regimens containing an aminoglycoside. In this study large number of patients having neutropenia were treated with monotherapy involving ceftazidime, and cefoperazone and patients whose ANC was expected to fall in next few days (i.e less than 500 / Cubic mm) responded satisfactorily to combination of 3rd generation cephalosporin and aminoglycosides. In a study done by Saral et al<sup>10</sup> addition of prophylactic antifungals in patient with neutropenia, in this study prophylactic antifungal were added in patient who took more than 2 weeks for complete clinical recovery, there were no incidences of mortality in these cases.

In this study the empirical treatment of these patients with appropriate antibiotics resulted in improvement in morbidity and mortality, as found in study by Rolston<sup>11</sup>.

Other study also show, early diagnosis and management of infections in cancer patients improves the prognosis in these patients, but further Indian studies are needed to form proper guidelines regarding treatment in Indian patients<sup>12</sup>.

**CONCLUSION**

Most common age groups of patients on chemotherapy affected

by infections included middle age and elderly. The patients commonly present with signs and symptoms of respiratory tract involvement. Risk factors for infective disorders include neutropenia and patients on anticancer treatment especially on combined Radiotherapy and Chemotherapy. Most common etiological organisms isolated were from Gram negative group who responded well to Cephalosporin and Aminoglycoside group of antibiotics.

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